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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Port-A-Punch[1] Recording and Computer Summarization of Pellet Count Data

David R. Patton and Wilson B. Casner[2]

Data are punched manually, directly on perforated computer cards, in the field. When a large number of deer and elk pellet plots are to be counted, the system will reduce office work and eliminate many errors from transposed figures. A Fortran computer program is presented which summarizes and prints the most common factors associated with pellet counts. No statistical tests are made in the program, but parameters for such tests are available from the computer printout. An average deck of 500 cards costs approximately $3 to run.

KEY WORDS: Programming (computers), elk, deer, wildlife management, Port-A-Punch, Fortran

Wildlife research and management biologists need fast and efficient methods of recording and summarizing pellet count data. Much time is lost in transferring information from field forms to office computation forms or computer cards. One efficient method is to record data directly on perforated computer cards at the time data are collected in the field.[3] The system includes a punch board, transparent template, data card, and stylus (fig. 1). A magazine attached to the back of the board provides space for storing 50 data cards.

Description of the equipment items and costs are:

Description	Cost (July 1969)
Port-A-Punch (IBM) board with template and stylus	$12.75
Port-A-Punch magazine	2.50
Port-A-Punch cards, blank	4.00/M

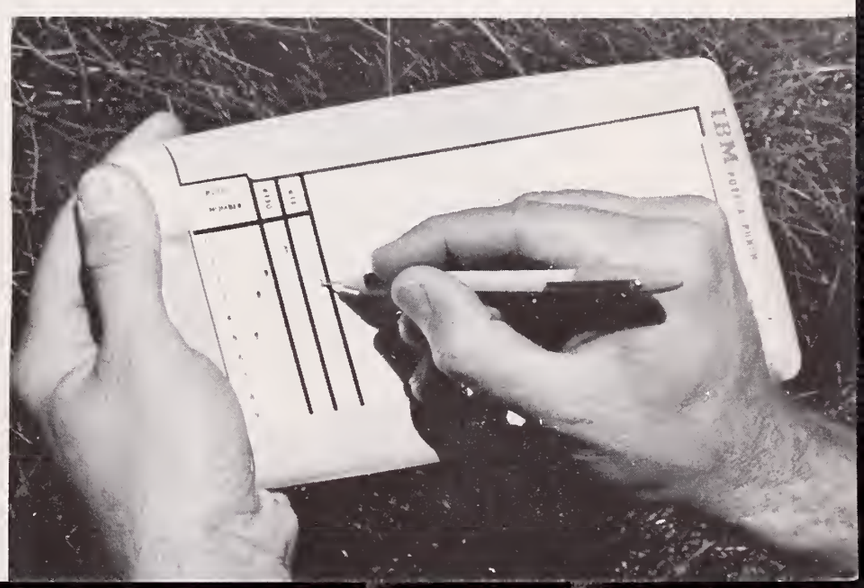

Figure 1.--Port-A-Punch board with data card punched. Plot number 532 contains 1 deer and 3 elk groups.

[1] *Trade and company names are used for the benefit of the reader and do not imply endorsement or preferential treatment by the U. S. Department of Agriculture.*

[2] *The authors are, respectively, Research Wildlife Biologist and Computer Programmer, located at Tempe, in cooperation with Arizona State University; central headquarters is maintained at Fort Collins, in cooperation with Colorado State University.*

[3] *Giles, Robert H., Jr. [Ed.] Wildlife management techniques. Ed. 3. 623 p. 1959. Wash. D. C.: Wildlife Soc.*

The standard computer card contains 80 columns, but the Port-A-Punch card has 40 data columns numbered 2,4,6,8. . .80. Cards can be printed with factors to be punched on the card, or a plain card can be used with factors marked on the transparent template. Press-on letters can be applied on the template and will stay attached when sprayed with plastic.

A Fortran IV source program and input data format has been designed for the Port-A-Punch card to summarize the most common factors associated with deer and elk fecal pellet counting. Cost of running a program will vary with the type of computer and the number of data cards. An average deck with 500 cards should cost approximately $3 to run. The cost includes the computer reading the program, calculating the factors, and printing the results.

General Field Technique

Data cards are inserted in the board so the perforated rectangles line up with the holes in the template. To enter data on the card, the stylus is used to punch out perforations in the proper column and row (fig. 1). An unpunched number is automatically read as zero. The first two rows (zone punch) of the card are not used. Data cards for the program presented in this Note must be punched in the following manner:

Column	Port-A-Punch card with 40 columns
2-4-6-8;	Plot number (0001 to 9998)
10-12;	Number of deer groups (1 to 99)
14-16;	Number of elk groups (1 to 99)

The number 9999 is used as a control card; therefore, there cannot be a plot numbered 9999.

Once the cards have been punched, they can be used in several ways. The primary use is as a data deck in a computer program to summarize the information or analyze it statistically. Cards also can be run through a lister to obtain a printout of the data on each card. A printout is useful in checking for errors.

Office Technique

A Fortran source program for the GE-400 series computer to summarize deer and elk pellet count data is shown below. With modification, the program can be used in other machines. Some constants used in calculations may change with application. Those most likely to change are referenced by line number (extreme left of listing) and explained at the end of the program.

FORTRAN SOURCE PROGRAM

```
 1       DIMENSION ND(2500),NE(2500),DEER(2500),ELK(2500),KD(22),KE(22),KDC
        1HK(22),KECHK(22),WSHD(6)
 2    60 DO 104 I=1,22
 3       KD(I)=0
 4       KE(I)=0
 5   104 CONTINUE
 6       READ 2,N,WSHD,T,PLTSZ
 7     2 FORMAT (I4,6A4,F4.3,F5.5)
 8       IF (N.EQ.9999) GO TO 99
 9       EN=N
10       DO 6 I=1,N
11       READ 1,NPLT,ND10,ND1,NE10,NE1
12     1 FORMAT (I4,5X,I1,1X,I1,1X,I1,1X,I1)
13       IF (NPLT-9999) 91,90,90
14    90 IND=N-I+1
15       KD(1)=KD(1)+IND
16       KE(1)=KE(1) + IND
17       GO TO 92
```

```
18   91 ND(I)=10*ND10+ND1
19      NE(I)=10*NE10+NE1
20      DEER(I)=ND(I)
21      KDCHK(1)=0
22      IF (ND(I)-KDCHK(1)) 61,61,62
23   61 KD(1)=KD(1)+1
24      GO TO 101
25   62 DO 105 J=2,21
26      K=J-1
27      KDCHK(J)=KDCHK(K)+1
28      IF (ND(I).EQ.KDCHK(J)) GO TO 63
29  105 CONTINUE
30      KD(22)=KD(22)+1
31      GO TO 101
32   63 IND=J
33      KD(IND)=KD(IND)+1
34  101 ELK(I)=NE(I)
35      KECHK(1)=0
36      IF (NE(I)-KECHK(1)) 64,64,65
37   64 KE(1)=KE(1)+1
38      GO TO 6
39   65 DO 106 J=2,21
40      K=J-1
41      KECHK(J)=KECHK(K)+1
42      IF (NE(I).EQ.KECHK(J)) GO TO 66
43  106 CONTINUE
44      KE(22)=KE(22)+1
45      GO TO 6
46   66 IN=J
47      KE(IN)=KE(IN)+1
48    6 CONTINUE
49   92 SD=0.0
50      SD2=0.0
51      INDL=I-1
52      IF (I.EQ.N) INDL=I
53      DO 13 I=1,INDL
54      SD=SD+DEER(I)
55   13 SD2=SD2+DEER(I)**2
56      AVED=SD/EN
57      VARD=(EN*SD2-SD**2)/(EN*(EN-1.0))
58      SYD=SQRT(VARD/EN)
59      DPGPA=SD/(EN*PLTSZ)
60      DCLIO=SYD*T*(1.0/PLTSZ)
61      DPS=DPGPA*.13487
62      CLDPS=DCLIO*.13487
63      DDUPA=DPS*.57031
64      CLDDU=CLDPS*.57031
65      SE=0.0
66      SE2=0.0
67      DO 26 I=1,INDL
68      SE=SE+ELK(I)
69   26 SE2=SE2+ELK(I)**2
70      AVEE=SE/EN
```

```
 71       VARE=(EN*SE2-SE**2)/(EN*(EN-1.0))
 72       SYE=SQRT(VARE/EN)
 73       EPGPA=SE/(EN*PLTSZ)
 74       ECLIO=SYE*T*(1.0/PLTSZ)
 75       EPS=EPGPA*.13487
 76       CLEPS=ECLIO*.13487
 77       EDUPA=EPS*.57031
 78       CLEDU=CLEPS*.57031
 79       PRINT 32,WSHD
 80    32 FORMAT ("1",33X,"COMPILATION AND PRELIMINARY ANALYSIS OF DEER-ELK
       1GROUPS",10X,"WATERSHED  ",6A4)
 81       PRINT 33,N,T,PLTSZ
 82    33 FORMAT    (//10X,"N = ",I4,3X,"T = ",F5.3,3X,"PLOT SIZE = ",F6.5,"
       1 ACRE")
 83       PRINT 34,SD
 84    34 FORMAT    (10X,"SUM OF DEER GROUPS",27X," = ",F12.2)
 85       PRINT 35,AVED
 86    35 FORMAT    (10X,"AVERAGE OF DEER GROUPS",23X," = ",F12.2)
 87       PRINT 37,VARD
 88    37 FORMAT    (10X,"VARIANCE OF DEER GROUPS",22X," = ",F12.2)
 89       PRINT 38,SYD
 90    38 FORMAT    (10X,"STANDARD ERROR OF DEER GROUPS",16X," = ",F12.2)
 91       PRINT 39,DPGPA
 92    39 FORMAT    (10X,"DEER GROUPS/ACRE",29X," = ",F12.2)
 93       PRINT 40,DCLIO
 94    40 FORMAT    (10X,"CONFIDENCE LIMITS FOR DEER GROUPS/ACRE",7X," = ",F
       112.2)
 95       PRINT 41,DPS
 96    41 FORMAT    (10X,"DEER/SECTION",33X," = ",F12.2)
 97       PRINT 42,CLDPS
 98    42 FORMAT    (10X,"CONFIDENCE LIMITS FOR DEER/SECTION",11X," = ",F12.
       12)
 99       PRINT 43,DDUPA
100    43 FORMAT    (10X,"DEER DAYS USE/ACRE",27X," = ",F12.2)
101       PRINT 44,CLDDU
102    44 FORMAT    (10X,"CONFIDENCE LIMITS FOR DEER DAYS USE/ACRE",5X," = "
       1,F12.2)
103       PRINT 45,N,T,PLTSZ
104    45 FORMAT    (/10X,"N = ",I4,3X,"T = ",F5.3,3X,"PLOT SIZE = ",F6.5,"
       1ACRE")
105       PRINT 46,SE
106    46 FORMAT    (10X,"SUM OF ELK GROUPS",28X," = ",F12.2)
107       PRINT 47,AVEE
108    47 FORMAT    (10X,"AVERAGE OF ELK GROUPS",24X," = ",F12.2)
109       PRINT 48,VARE
110    48 FORMAT    (10X,"VARIANCE OF ELK GROUPS",23X," = ",F12.2)
111       PRINT 49,SYE
112    49 FORMAT    (10X,"STANDARD ERROR OF ELK GROUPS",17X," = ",F12.2)
113       PRINT 50,EPGPA
114    50 FORMAT    (10X,"ELK GROUPS/ACRE",30X," = ",F12.2)
115       PRINT 51,ECLIO
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```
116    51 FORMAT    (10X,"CONFIDENCE LIMITS FOR ELK GROUPS/ACRE",8X," = ",F1
         12.2)
117       PRINT 52,EPS
118    52 FORMAT    (10X,"ELK/SECTION",34X," = ",F12.2)
119       PRINT 53,CLEPS
120    53 FORMAT    (10X,"CONFIDENCE LIMITS FOR ELK/SECTION",12X," = ",F12.2
         1)
121       PRINT 54,EDUPA
122    54 FORMAT    (10X,"ELK DAYS USE/ACRE",28X," = ",F12.2)
123       PRINT 55,CLEDU
124    55 FORMAT    (10X,"CONFIDENCE LIMITS FOR ELK DAYS USE/ACRE",6X," = ",
         1F12.2)
125       PRINT 83
126    83 FORMAT(///,40X,"FREQUENCY DISTRIBUTION - DEER GROUPS/PLOT")
127       PRINT 84
128    84 FORMAT  (//,9X,"NO. OF GROUPS/PLOT",5X,"0",3X,"1",3X,"2",3X,"3",3X
         1,"4",3X,"5",3X,"6",3X,"7",3X,"8",3X,"9",2X,"10",2X,"11",2X,"12",2X
         2,"13",2X,"14",2X,"15",2X,"16",2X,"17",2X,"18",2X,"19",2X,"20",2X,"
         3GT 20")
129       PRINT 85,(KD(I),I=1,22)
130    85 FORMAT    (/,9X,"NO. OF PLOTS",8X,21(1X,I3),3X,I3)
131       PRINT 86
132    86 FORMAT(///,40X,"FREQUENCY DISTRIBUTION - ELK GROUPS/PLOT")
133       PRINT 84
134       PRINT  85,(KE(I),I=1,22)
135       GO TO 60
136    99 PRINT 999
137   999 FORMAT (//"END OF JOB")
138       CALL EXIT
139       END
```

The value .13487 in cards numbered 61, 62, 75 and 76 and .57031 in cards numbered 63, 64, 77 and 78 may change because they represent the relationship between animals per section per year and pellet groups per acre per year. Variables are inserted on a header card placed in front of the data deck. Header cards are punched in the following manner:

Column	Standard Card With 80 Columns
1 to 4	Number of plots (1 to 9998)
5 to 28	Identification (24 letters or less)
29 to 32	"t" value (decimal is not punched on the card but the computer has been programmed to place the decimal after the 1st digit).
33 to 37	Plot size (.00001 to .99999), decimal is not punched.

The source program presented here was written for 2,500 plots. To change the number of plots, the number in parentheses in the dimension statement (card number 1 in the program) is changed.

The source program will summarize the data, and a printout will show factor values as in the following example:

COMPILATION AND PRELIMINARY ANALYSIS OF DEER-ELK GROUPS

WATERSHED WILLOW CREEK EAST FORK

N = 182 T = 1.653 PLOT SIZE = .00300 ACRE

SUM OF DEER GROUPS	=	26.00
AVERAGE OF DEER GROUPS	=	0.14
VARIANCE OF DEER GROUPS	=	0.20
STANDARD ERROR OF DEER GROUPS	=	0.03
DEER GROUPS/ACRE	=	47.62
CONFIDENCE LIMITS FOR DEER GROUPS/ACRE	=	18.29
DEER/SECTION	=	6.42
CONFIDENCE LIMITS FOR DEER/SECTION	=	2.47
DEER DAYS USE/ACRE	=	3.66
CONFIDENCE LIMITS FOR DEER DAYS USE/ACRE	=	1.41

N = 182 T = 1.653 PLOT SIZE = .00300 ACRE

SUM OF ELK GROUPS	=	1.00
AVERAGE OF ELK GROUPS	=	0.01
VARIANCE OF ELK GROUPS	=	0.01
STANDARD ERROR OF ELK GROUPS	=	0.01
ELK GROUPS/ACRE	=	1.83
CONFIDENCE LIMITS FOR ELK GROUPS/ACRE	=	3.03
ELK/SECTION	=	0.25
CONFIDENCE LIMITS FOR ELK/SECTION	=	0.41
ELK DAYS USE/ACRE	=	0.14
CONFIDENCE LIMITS FOR ELK DAYS USE/ACRE	=	0.23

FREQUENCY DISTRIBUTION - DEER GROUPS/PLOT

NO. OF GROUPS/PLOT	0	1	2	3	4	5	6	7	20
NO. OF PLOTS	162	15	4	1	0	0	0	0	 0

FREQUENCY DISTRIBUTION - ELK GROUPS/PLOT

NO. OF GROUPS/PLOT	0	1	2	3	4	5	6	7	20
NO. OF PLOTS	181	1	0	0	0	0	0	0	 0

Many data decks can be processed at the same time. Each deck contains a header card and a control card consisting of the number 9999 following the last data card. The 9's card is punched on the standard card in columns 1 to 4. To end the program two 9's cards are required after the last data card in the final deck. A typical setup for two data decks is shown in figure 2.

The formulas used to summarize the data are found in any statistics text. No statistical tests are made in the program, but the parameters are available for such tests.

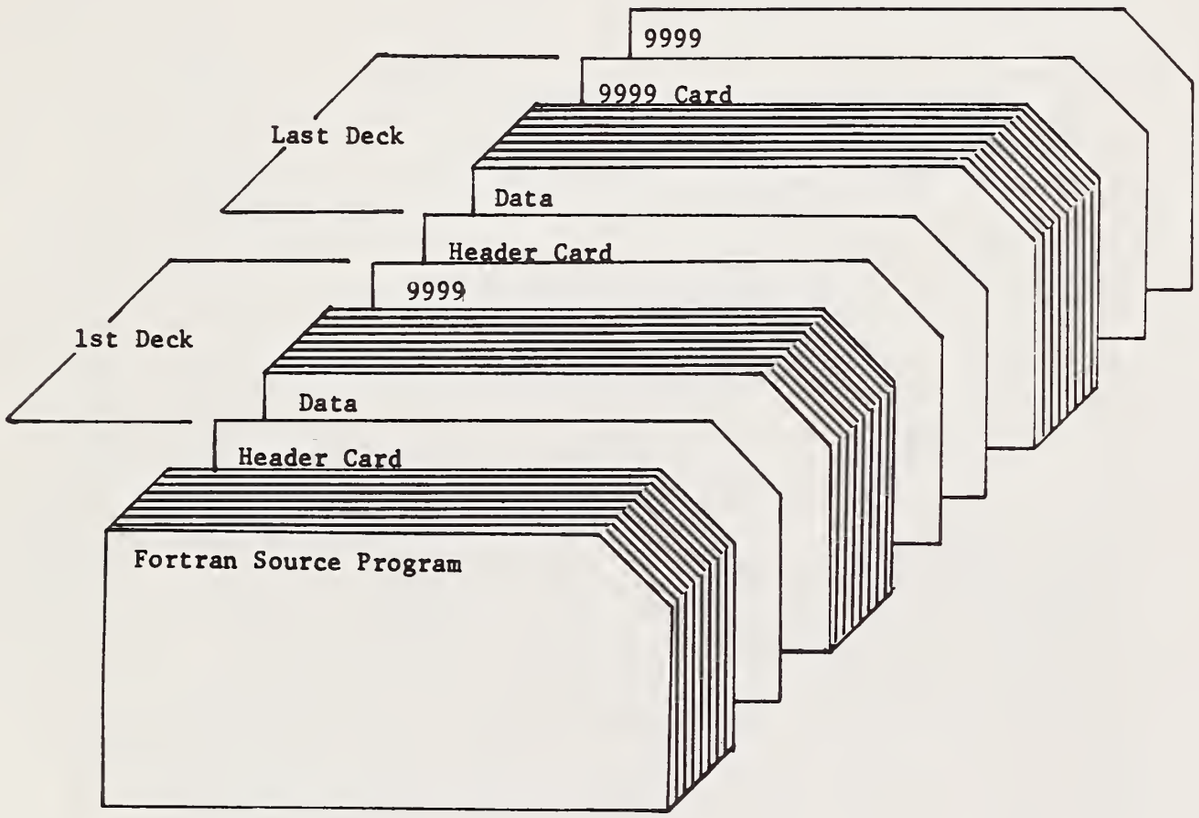

Figure 2.--Data deck set up for insertion in the computer (minus control cards necessary for run on a specific computer).

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As our Nation grows, people expect and need more from their forests—more wood, more water, fish and wildlife; more recreation and natural beauty; more special forest products and forage. The Forest Service of the U. S. Department of Agriculture helps to fulfill these expectations and needs through three major activities:

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- *Participating with all State forestry agencies in cooperative programs to protect, improve, and wisely use our Country's 395 million acres of State, local, and private forest lands.*
- *Managing and protecting the 187-million acre National Forest System.*

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